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Automated driving

Highly automated vehicles

Discussion paper on possible driver's "other activities" while an automated driving system is engaged

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This document aims to facilitate discussions on driver activities (i.e. "activities other than driving") in a highly automated vehicle.

I. Background

The report of the 75th WP 1 session recalls that at its previous session WP.1 agreed on principles in the context of paragraph 6 of Article 8 of the 1968 Convention, namely its first sentence: "*A driver of a vehicle shall at all times minimize **any activity other than driving***". In addition, it is worth noting the comparative requirement in Article 10 of the 1949 Convention "*The driver ... shall drive in a reasonable and prudent manner*".

- In its 75th session, WP.1 agreed that no amendment to either Convention was necessary at this time. It was also agreed that the "other activities" noted in the principles should be better elaborated, in particular with reference to the activities which could compromise road safety or endanger road users. WP.1 agreed to begin work on the elaboration of a set of recommendations on the topic. The IGEAD was requested to prepare a proposal.

- It is indeed the purpose of the current draft document/discussion paper, i.e. to provide some recommendations on the more detailed interpretation of the Conventions' requirement that the driver shall minimise activities other than driving, as part of efforts to prevent dangers to road safety. However, this is a discussion paper to explore basic principles on the kinds of drivers' adaptive behaviour which the Conventions do not prevent, and should not be understood as stating that such activities are safe. Therefore, countries may wish to impose other domestic regulation as they see fit.
- The target of the current discussion paper is to pave the way toward full automation by elaborating a common understanding on this item. WP.1 at its 75th session confirmed that the two principles will be applied by the States parties to the Vienna Convention as well as considered/followed by those applying the Geneva Convention.
- The target of this discussion paper is certainly not an attempt to harmonise those different situations, but rather to find a common envelope of those "other activities" depending on the level of automation. While technologies are likely to be developed to meet a global market, it may be appropriate for some differences in how those technologies are used to exist at national level to reflect national context.
- To better understand, and to ease the discussion at the 76th WP.1 session (March 2018), hereunder the term "level of automation", with reference to their SAE definitions, will be used.

II. Explanatory definitions

- "Secondary activities (Level 3-5)": mean activities that go beyond the use of e.g. radio/navigation/Air Conditioning/Heating systems etc. that are accepted today for manual/assisted driving".
- "Operational Design Domain (ODD)" refers to the environmental, geographic, time-of-day, traffic, infrastructure, and other conditions under which an automated driving system is specifically designed to function.

III. Principles and basic key criteria

- As stated in the 75th WP.1 session report the two principles are as written below:

"When the vehicle is driven by vehicle systems that do not require the driver to perform the driving task, the driver can engage in activities other than driving as long as:

1: these activities do not prevent the driver from responding to demands from the vehicle systems for taking over the driving task, and

2: these activities are consistent with the prescribed use of the vehicle systems and their defined functions."
- 1st principle:
 - o Each time the automated system issues a take-over request the driver is expected to take over the driving task, and hence they must be able to do so. Their inability to takeover could compromise road safety or traffic flow, especially in Level 3 systems. This means that the "other activities" meet here their first barrier.
 - o Level 3 (conditional automated driving): there may be several take over demands from the system during a journey within the ODD. Should the driver fail to take

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- over dynamic control of the vehicle, the system initiates the transition to the minimal risk condition (e.g. automatically start to slow down the vehicle immediately and therefore minimize danger to vehicle occupants and other road users).
- o level 4 (highly automated driving): driver’s intervention may be expected to resume dynamic control of the vehicle at the end of the ODD. The driver would need to further adapt (e.g. reduce) their secondary activities to safely continue the rest of their journey. Should the driver not take over dynamic control of the vehicle following a system request, the vehicle should perform a minimum risk manoeuvre which would minimise danger to the vehicle’s occupants and other road users
- 2nd principle: highlights the consistency between those “other activities” and “the prescribed use of the vehicle systems and their defined functions”
- o The key is as follows: the driver’s physical and/or cognitive engagement in the secondary activities must be adapted to the vehicle’s degree of automation:
 - complex secondary activities requiring a high level of physical and/or cognitive engagement have a significant impact on the driver’s capability to take-over the operation of the vehicle
 - simple secondary activities not requiring a high level of physical or cognitive engagement have a lower impact on the driver’s capability to take-over the operation of the vehicle
 - o Focus on vehicle integrated communication displays (so called “infotainment systems”) that are operated from the driver’s seat...
 - o ...because they are developed under full control of the vehicle manufacturer...
 - o ... and can be controlled by the automation system: in case of a take-over request, secondary activities are automatically terminated by the system (i.e. the projection on the screen instantly vanishes and the takeover request is instead displayed)
 - o Automation system ensures sufficient lead time for a safe take-over
 - o It is anticipated that manufacturers will develop systems that support drivers of Level 3 and 4 vehicles to safely undertake other activities. Such systems may monitor driver availability, and be tied in to the automation system in a way that makes (Level 3) or encourages (Level 4) a driver to resume control, and ensures a sufficient lead time for a safe takeover, and thus support road safety outcomes. Any such systems would need to be verified as being compliant with recognized technical standards.

IV. Potential examples of secondary activities for automated driving:

- Use of the vehicle infotainment system, located perceptually upright to the driver, for secondary activities which are not related to the driving task (e.g. video streaming, e-mailing, use of the internet, video-chats, Skype meetings with shared desktop, etc.)

- Use of hand-held consumer electronic devices (smartphone + tablet) that are physically or electronically linked to the vehicle infotainment system (e.g. via an app or other measures) and therefore can be commanded by the vehicle's HMI
- For high levels of automation, use of hand-held consumer electronic devices (smartphone + tablet) that are not linked to the car infotainment system and reading (books + newspaper),.
- Research demonstrates the necessity of managing a driver's attention, so that they are alert enough and have sufficient situational awareness to resume control from the automation system. However, it is not clear what specific 'other activities' deliver this condition and thus meet the road safety outcomes sought by the principles above. Therefore, studies, researches, and experiments are needed to identify what activities can be done safely. Should WP29 develop safety standards that facilitate drivers to safely undertake specific 'other activities' in line with principles above, then WP1 can consider if such activities are permissible.

V. Conclusions¹

(a) Depending on the level of automation some "other activities" could be allowed, others not. It depends on what the level of automation expects the driver to do. The type of activities should not be described in detail, the possible impact of the secondary activity on a takeover demand is the critical criterion.

(b) In case the automated mode (high or full automation) is engaged, performing "other activities" is never an obligation; for the near future one can also state that the general basic principle remains "to minimize other activities", but that nevertheless some activities might be allowed depending on the level of automation.

¹ Note from the author

It is almost obvious that from one country to the other "other activities" or "secondary activities" that will be allowed or let's say will not be forbidden, will differ. Nevertheless as already said at the beginning of this document, its purpose is to provide some recommendations regarding this issue which all Contracting Parties can agree upon. Already today this issue is not fully harmonised amongst countries even those which have signed either the Geneva or the Vienna Convention on road traffic. At the end it is important to know precisely what will be the legislation in each country, again provided that the core legislation in this area will be common, because based on the recommendations developed in this document.